



Bighorn Canyon National Recreation Area
20 HWY 14 A East
Lovell, WY 82435



Bighorn Canyon National Recreation Area School Curriculum

Teacher's Guide Grades K-8





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Bighorn Canyon National Recreation Area
Lovell, Wyoming/Fort Smith, Montana

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Bunkhouse at M/L Ranch NPS Photo

Dear Teacher

I began working at Bighorn Canyon National Recreation Area as a seasonal ranger in 1998. I have had the opportunity to work in the field as well as with the public. For the last five years, I have worked in the interpretation division. It is my job to tell visitors about the park and to research and write text for the signs seen along the road. Through my research, I am always inspired to explore new places in the canyon; learning a little more about the park every year. I enjoy sharing my experience with visitors and school groups in hopes they too can make their own connections to Bighorn Canyon.

Each year more and more teachers are interested in using Bighorn Canyon as a tool to help their students understand the natural world around them. It is my goal and the goal of our teacher team to help them and their students experience the amazing resources that Bighorn Canyon has to offer.

The teacher team has spent several hours of their own time helping to develop a curriculum and teacher guide to help other teachers share the wonders of Bighorn Canyon with their students. It is our hope that this teacher guide can be used by teachers in the local area as well as teachers around the nation. The

curriculum is designed to meet Wyoming and Montana state standards. In this guide you will find several activities with background information. Some activities are designed as pre-field trip and post-field trip activities while others are designed to stand alone for those teachers that are unable to bring their students to Bighorn Canyon.

Please use this as you see fit. Most activities were developed with a certain age group in mind, however, teachers can easily adapt each lesson for upper or lower grades to best serve their needs.

On behalf of myself and the teacher team, we hope that you find this guide helpful and are able to inspire the students to learn about the wonders of nature around them.

Sincerely

Christy Fleming
Bighorn Canyon NRA

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Field Trips

For those teachers that are able to bring their students to Bighorn Canyon for field trips, the following information can be used to assist teachers in preparing for their field trips.

Field Trip Topics

Geology	Jim Staebler	History	Christy Fleming
Wildlife	Jim Staebler		Jim Staebler
Pryor Mountain Wild Horses	Jim Staebler	Lockhart Ranch	Christy Fleming
	Christy Fleming	Mason Lovell Ranch	Christy Fleming
Bighorn Sheep	Jim Staebler	Hillsboro Ranch	Christy Fleming
	Christy Fleming	Ewing/Snell Ranch	Christy Fleming
Plants	Jim Staebler	Crow Indians	Jim Staebler
		Recreational Activities	Jim Staebler
		Governmental Management	Jim Staebler
		Environmental Awareness	Jim Staebler
			Christy Fleming

How to Schedule

1. Contact Christy Fleming or Jim Staebler at 307-548-5406 to schedule your visit. You will need to provide the following information:
 - a. the proposed date of the field trip
 - b. the proposed time / duration of the field trip
 - c. what grade or grades of students participating
 - d. the number of students
 - e. the number of chaperones
 - f. the group leaders name and contact information including the schools name, address, and phone number
2. Choose a topic or topics from this guide or create your own that you would like to cover while on the field trip.
3. Fill out the Fee Waiver on pages 10 and 11 of the teacher guide and fax to the park for approval.
The fax number is 307-548-7826.

Fee Waiver Information and Requirements



Bighorn Canyon charges a \$5.00 entrance fee per vehicle to enter the park. This fee can be waived for education by meeting the following criteria. Requests for fee waivers must be made at least two weeks in advance of the trip.

CRITERIA:

- Groups must be from an accredited educational institution. Proof may be required that shows that your group is a non-profit educational organization.
- Your group must be coming to Bighorn Canyon for educational purposes related to the park and your school curriculum. An itinerary and specific purpose for your visit will be required.

Groups not meeting the criteria for a fee waiver will be required to pay the above fee to enter the park.

To make requests for a fee waiver, call (307)-548-5402 between 8:30am and 3:30pm. Requests may also be made by mail, but should be mailed in advance so we receive it at least two weeks prior to desired field date. Include your name, address, day time phone number with your request. A fee waiver form will be mailed to you to fill out and return to us before the date of the program.

Mail the application to:

Educational Outreach Services Coordinator
Bighorn Canyon National Recreation Area
20 Highway 14A East
Lovell, Wyoming 82431

Or fax to: 307-548-7826

Application for Fee Waiver



Bighorn Canyon National Recreation Area

EDUCATIONAL INSTITUTION NAME, ADDRESS & PHONE NUMBER:

LEADER OF GROUP (name & title):

NUMBER OF STUDENTS: _____

GRADE(S) OF STUDENTS: _____

NUMBER OF ADULTS: _____

DATE(S) OF VISIT: _____

TIME OF VISIT: _____

PURPOSE OF VISIT – STATEMENT OF EDUCATIONAL AND/OR SCIENTIFIC OBJECTIVES WHICH ARE TO BE ACCOMPLISHED THROUGH THIS VISIT & HOW THIS VISIT SPECIFICALLY RELATES TO BIGHORN CANYON RESOURCES (include a copy of course curriculum and itinerary for trip).

CERTIFICATION: “I hereby certify that the above statements are true and accurate to the best of my knowledge and are submitted for the explicit purpose of obtaining a waiver of fees.”

Signature

Date

FEE WAIVER APPROVED _____ FEE WAIVER DISAPPROVED _____

Signature – Educational Outreach Services Coordinator Date

Field Trip Reminders and Expectations

After scheduling the field trip, here are a few trip reminders and expectations we have to make your field trip educational and fun.

Teachers

1. Please use name tags
2. Check to be sure that students have water, food, sturdy shoes, and other gear before leaving the classroom.
3. Split the class into small groups of no more than 6. Each group should have an adult.

Students

1. Bring your imagination
2. Wear comfy, outdoor clothes and sturdy shoes
3. Bring a jacket / coat
4. Wear a hat and / or sunscreen
5. Bring plenty of water
6. Bring a snack and a lunch

The 3 R's

Respect Yourself

1. Learn as much as you can.
2. Have as much fun as you can.
3. Remain positive even if you can't seem to master a problem
4. Let someone know you are having a problem

Respect Each Other

1. Listen to each other and instructors, without interrupting.
2. Support each other: No put downs or fighting.
3. Be safe

Respect the Environment

1. Enjoy rocks and plants, but do not remove or disturb them.
2. Watch the wildlife from a distance
3. Pack out what you pack in, and pick up other litter you find even if it's not yours.

Bighorn Canyon is an outdoor classroom. We are here to learn and have fun!

And Introducing Bighorn Canyon National Recreation Area...

Bighorn Canyon National Recreation Area was established by congress October 15, 1966, “to provide for recreational use and enjoyment of Bighorn Lake and adjacent lands, and to preserve the scenic, scientific, and historic resources.”

Straddling the border between south central Montana and north central Wyoming, Bighorn Canyon offers a diversified landscape of forest, mountains, upland prairie, deep canyons, broad valleys, lake and wetlands. Encompassing about 120,000 acres, including 12,700 acres of Bighorn Lake, it offers something for everyone.

At the north end of the Bighorn Canyon is the Yellowtail Dam. The dam was named after Robert Yellowtail, former tribal chairman of the Crow Tribe. The 525 foot thin arch type dam was completed in 1965 for flood control, irrigation and electrical power. On the south end of Bighorn Canyon is the Yellowtail Wildlife Habitat Management Area. Riparian zones of cottonwood forest, scrublands and wetlands provide habitat for white-tailed deer, bald eagles, pelicans, heron, waterfowl, wild turkeys, and other species. No matter the season, this is the place for bird watchers to add birds to their checklist. Most visitors are drawn to the recreational opportunities of boating, waterskiing, fishing, and scuba diving that the dam created. However, the park offers more than just the lake. Hiking, camping, and wildlife viewing are also popular. Visitors can view the bighorn sheep, Pryor Mountain Wild Horses, mule and white-tail deer, and over 200 species of birds. They can hear stories of people adapting to the harsh environment from as far back as 10,000 years ago to present times.

Throughout Bighorn Canyon there are opportunities to learn about the rich di-

versity of history. Historic sites include the Bad Pass Trail, and four historic ranches. The Bad Pass Trail dates back as many as 10,000 to 12,000 years. The historic ranches are just over 100 years old. The history of Bighorn Canyon teaches us a lesson on how people traveled through the area and how they survived while they were here.

The geology of the canyon offers colorful views and a sense of awe. The canyon was formed by a combination of accelerated stream erosion and gradual regional uplift. Much of it is narrow and confined within sheer walls as high as 1,000 feet.

No matter the visitors' interest, Bighorn Canyon National Recreation Area is a great place to learn about geology, history, and life sciences. In the following pages, enjoy the activities and learning about Bighorn Canyon National Recreation Area.



Crinoids - Smithsonian Display
A. Sharon

Level I Kindergarten to Fourth Grade

The activities in this section are designed for kindergarten through fourth grade. All activities can be changed to best suit the teachers need. The activities and levels are designed as building blocks. All of the items in Level I correspond in some way and are introductory to the items in Level II.

Activity 1 Geology

JUST A PLAIN OLD ROCK? By Jim Staebler

The Earth is always changing. Some change we all notice such as the changing seasons. Some we won't see unless we looked close before and saw and remembered what there was to see. If we start to pay better attention to the world around us, we might notice more of the changes taking place. Sometimes we need to look closer. Sometimes we need to look at everything over a period of time. Those big rocks at the bottom of the canyon came falling down from the cliff

above. The sand and pebbles on the shore of the lake are arranged in a special way. Where are the tracks we made in this dry stream bed the last time we walked there? It sure seems dryer here the last few years. Maybe we can find out just how dry it has been.

Geologists study Earth looking for changes and trying to understand what the rocks are able

Continue on page 15

Scientists have discovered that there are three main ways that rocks form and have thus separated rocks into three main groups.

Just a Plain Old Rock from Page 15

to tell us. We can find fresh mud along the riverbanks after a spring storm. Seashells can be found in rocks. By studying the rocks and the mountains and canyons made up of rocks, geologists have discovered many of the secrets the rocks have to tell. Geologists know Earth is over 4.5 billion years old. That is a lot of time and many, many things have happened. We are beginning to understand why that mountain is over there and how it got there. But there is so much more to discover. If you start studying the rocks, they may speak to you also.

Rocks come in many different colors and can vary in size from ones we can hold in our hands to ones it takes hours to drive across. Some are hard and others we can easily break apart with a hammer. Some are smooth and some are rough. But they all have one thing in common: they are made up of different minerals in different combinations. Minerals are different kinds of atoms combined in a specific manner. With all the different kinds of atoms there are that means we can make up many, many different kinds of minerals and with all those minerals we can make up a lot of different kinds of rocks. Maybe it is a good thing that a relatively few kinds of rocks make up most of the mountains and canyons we see near here and we can study those kinds of rocks first.

Scientists have discovered that there are three main ways that rocks form and have thus separated rocks into three main groups. Scientists like to put things into groups of things that have the same characteristics. The three groups of rocks are igneous, sedimentary and metamorphic.

Igneous rocks form from hot liquid magma that turns into rock as it cools. If it happens below the surface they are called intrusive and if it happens on the surface where we can watch they are called extrusive or volcanic rocks. Talk about exciting and dangerous – nothing like watching volcanoes!

Sedimentary rocks are formed when small or even sometimes large or various sized particles and brought together in some place where they are eventually buried by more and more rock material. This often happens in the deep oceans or along the shallow shore as well as in vast sand dunes. The particles may be cemented together by a kind of chemical that acts as glue or they may be turned into rocks just by all the weight of the rock material they are buried under.

Metamorphic rocks start out as any of the three different kinds of rocks, but then they are changed into a different kind of rock through great heat and pressure deep beneath the surface. Yes one kind of metamorphic rock can become another kind of metamorphic rock. Some

times they look like they have been squeezed or twisted or bent.

When a rock gets to or near the surface it can start to break apart through the actions of water, chemicals, hot and cold, what vegetation is growing in the area. Gradually soils may develop and they are very important because soils are what vegetation grows upon, and vegetation is the base for the animal populations.

But rocks also move! They may fall down from steep cliffs. Little pieces may get blown around by the wind. Rivers and streams can wash them away. When a rock moves it is eroding. One amazing thing you may some day come to see is just how much rock material has been eroded away. When you look at the canyon, match up the layers of rock from one side to the other. That space used to be filled with rock matching those layers. And that is just part of the erosion that has happened here.

If we start to study the layers of rock we can get an idea of how things used to be when each layer formed long, long ago. The Madison Limestone is made of lime material and has some shells in it so we know it formed when there was an ocean here. Now the Madison Limestone makes up the top 700-800 feet of the canyon walls for the entire 50 mile length of the canyon. Now that's a big rock. The Tensleep Sandstone has ripple marks made of sand grains that were formed as a result of deposition by waves in a near shore environment. We can find that exact same kind of ripple marks along our shores today and in fact that is why we know how they were formed that way in the first place.

Perhaps most exciting is studying the different layers in order to learn how the mountains and canyons came about. What do you need to look for when studying the rocks? While visiting Big-horn Canyon will you be able to hear the rocks tell their story?

Rock Building



Science, Language Arts, Speaking and Listening

- Standards:** Wyoming Science : Standard 1, Benchmark 6 & 7
Standard 2, Benchmark 1
Wyoming Language Arts: Standard 3, Benchmark 1 through 5
Montana Speaking and Listening: Standard 2, Benchmark 1 & 2
Standard 4, Benchmark 3
- Duration:** 1 hour to make the rock and talk about the process, one day of good sun to cure the rock
- Class Size:** Any, broken into teams

Objectives

At the conclusion of the rock building exercise, students will:

1. Understand the rock building process
2. Understand the element that work together to build a rock

Materials

- Used coffee grounds
- Flour
- Water
- Bowl
- Cookie sheet
- Treasures
- Pan of gravel

Vocabulary

Igneous rocks: are formed as hot liquid magma cools and turns to rock

Sedimentary rocks: are formed when small or even sometimes large or various sized particles and brought together in some place where they are eventually buried by more and more rock material.

Metamorphic rocks: start out as any of the three different kinds of rocks, but then they are changed into a different kind of rock through great heat and pressure deep beneath the surface.

Procedure

1. To symbolize how minerals are forced together to form rocks, combine used coffee grounds and flour into a bowl. There should be twice as much coffee as flour in your rock mixture. Depending on how old the coffee grounds are, they may still retain some of their moisture.
2. Stir water in a little at a time until you get a stiff, sticky, batter-like mixture. Add more flour if the batter isn't sticky. This symbolizes the water of the inland seas that covered Bighorn Canyon.
3. Scoop out handfuls of the mixture and form into balls. At this point you can poke a hole in the ball and add treasures to the center, reshaping it into a ball. Roll the balls through the pan of gravel. Some small, colorful rocks are a nice addition to the gravel. To symbolize the pressures that compress the minerals into rock, push and pull the ball into a rock shape.

Rock Building Cont.



Science, Language Arts, Speaking and Listening

Procedures Cont.:

4. When you are done, put the rocks on a cookie sheet. You can either harden these rocks by cooking them in the oven at 350 degrees or put them in a sunny window for a day or two.
5. When the rocks have hardened, you can hide them around the class room or playground. Have a scavenger hunt and then break them open to discover the treasures inside.

Closure

After building the rocks, discuss how this activity is similar to the way rocks are formed.

1. What caused the shape of the students' rocks?
2. How is that similar to the way rocks are formed?
3. Which of the three sedimentary rocks found in Bighorn Canyon does this one most resemble?

Additional Activities

1. Students could make rock candy.
 2. Conduct a rock scavenger hunt along the State Line Trail looking for rocks with the traits discussed in this activity.
- Remember only take notes or draw what was found.

The Ever Changing Earth



Science, Language Arts, Speaking and Listening

Standards: Wyoming Science: Standard 1, Benchmark 6
Wyoming Language arts: Standard 3, Benchmark 1 through 5
Montana Speaking and Listening: Standard 2, Benchmark 1 & 2
Standard 4, Benchmark 3

Duration: 20 Minutes
Class Size: Any

Objectives

It is easy to study some changes to the world around us, but others are harder to study. For instance, the change of seasons is easy to study. Most people remember the change from winter to summer. However, geologic change is more difficult to study. Changes to the landscape can happen over decades of time or can happen quickly. This activity will illustrate that the earth is always changing. Even though we don't always notice the changes, how do they affect us and the world around us?

Materials

- One small carton of milk from the cafeteria
- 4 different colors of food coloring
- Eye dropper full of dish soap
- Deep sided cookie sheet

Procedure

1. Pour milk into the cookie sheet.
2. Have the students tell you the kinds of things they find on the earth. Animals and plants will be symbolized by a color, rocks and soil by another color, water elements by another color, and weather elements by the last color. Put one drop of food coloring in for each item the students tell you.
3. When they can no longer think of items that make the earth what we know it today, add one drop of dish soap. This will make all of the colors start to swirl together. It will do this for awhile, continually changing. If it starts to slow down you can add another drop of dish soap. It will begin to swirl again.

Closure

1. Discuss how the earth is always changing.
2. How does each element effect change on the earth?
3. How can scientist study these changes?



Crow Tipi Village

A. Wolf

Activity 2

History - The Power of a Story

Trails Through the Years

By Christy Fleming

The Bad Pass Trail, marked by rock cairns, weaves its way along the rugged western edge of Bighorn Canyon, from the mouth of the Shoshone River to the mouth of Grapevine Creek. One may guess from its name that the Bad Pass trail was not an easy trail. It was better than the alternatives of crossing the mountains or the dangers of possibly drowning in the untamed waters of the Bighorn River coursing through the canyon. The Crow told stories of evil spirits that resided in the canyon, serving as an additional deterrent to river travel.

Native people walked and camped along this trail for 10,000 to 12,000 years while traveling to the buffalo plains. Early trappers and traders such as Jim Bridger and Jedediah Smith used it to transport furs to St. Louis, avoiding the dangers of floating the Bighorn River. Later ranchers and settlers used the trail to get to their property on the Dry Head. As the settlers started to use the Bad Pass Trail, foot and horse traffic turned to freight wagons and then to vehicles. This

was still not an easy trip. It was a well known fact by those that drove along the trail, that they should always carry a tire repair kit with them as they were almost guaranteed at least one flat tire along the way.

Today the park road follows closely the original path of the Bad Pass, some times following over the top of it. If this trail could talk it would have years of stories to share. The stories of adventure have now turned to stories of wildlife viewing and recreation. As the years go by more stories will be added and others will study them. Who knows, maybe someday in the future, students will be studying our impact on the Bad Pass Trail.

How the Canyon got its Name



Social Studies, Language Arts, Reading, Speaking and Listening

Standards:	Wyoming Social Studies: Standard 4, Benchmark 1 & 3 Standard 5, Benchmark 4
	Wyoming Language Arts: Standard 1, Benchmark I – B & C Standard 2, Benchmark II – B 1 through 3 Standard 3, Benchmark 1 through 5
	Montana Social Studies: Standard 1, Benchmark 1 & 2 Standard 4, Benchmark 3
	Montana Reading: Standard 4, Benchmark 4
	Montana Speaking and Listening: Standard 2, Benchmark 1 & 2 Standard 3, Benchmark 1 through 4 Standard 4, Benchmark 3
Duration:	On Site Visit - 45 min. walk along part of the Bad Pass Trail
	Off Site Visit – This may need a couple class periods for research and presentation time
Class Size:	Any

Objectives

As students of history, we can learn a lot about different areas from legends and stories that are passed down through generations. After reading *The Legend of Big Metal* students will:

1. Understand how Bighorn Canyon came to be named.
2. Discover other myths, legends, or stories that were behind the naming of other landmarks in their area.
3. Will interview and retell a story told to them by a family member.

Vocabulary

Absaroka: The real name for the Crow. French explorers thought this word meant large black bird which they interpreted as crow.

Myth: Stories of fictions or half truths forming part of the ideology of a society or culture.

Legend: An unverified popular story handed down from earlier times.

Story: The narrating or relating of an event or series of events, either true or fictitious.

Precarious: Dangerously lacking in security or stability.

Perpendicular: At right angles to the horizontal; vertical.

Setting the Stage

Discuss the difference between myth, legend, and stories. How do these stories help us to learn about the history of an area? Can stories change over time?

Procedure:

On Site

1. Listen as the ranger tells stories about the people that lived in Bighorn Canyon.
2. Imagine yourself traveling through Bighorn Canyon as a Native American, a Mountain Man, or early settler and write a journal about what you might have experienced.

Off Site

1. Ask a relative to tell a story about your family and retell it to your class. Discuss why it is historically significant to your family's history.
2. Find a building or landmark that has an interesting name and try to find out how it got its name.

How the Canyon got its Name Cont.



Social Studies, Language Arts, Reading, Speaking and Listening

Closure:

As a class, review the story of Big Metal and how it relates to the stories told either in each student's journal, the stories told to the students by family members, or the stories on how areas were named. Do the stories have any similarities? What is the importance of story telling?

Additional Activities

1. The class could put together a booklet of their family histories.
2. Have students stand in a line. Whisper something in the first student's ear and then have them relay it and see how it turns out in the end. Relate that to how stories can change over time.
3. Teachers could invite a representative from the local historic society to share stories about their area with the students.

The Legend of Big Metal Crow Legend

*But it is the country itself
and the deeply-rooted
history of the people,
who call this land home,
which casts a spell over
those who would let it.
For this is the Bighorn
and as the Bighorn, it
shall endure.*

According to Crow Legend, the name Bighorn must endure, for should the name Bighorn ever leave the water, the Crow people would be no more. Due to the legend of Big Metal, Bighorn Canyon, the water of the lake and the river will forever be called Bighorn.

In the days soon after the Crow came to this area, a boy and his stepfather went hunting. While the boy was looking over the edge of the canyon, the stepfather pushed him. The boy disappeared from view. The cruel stepfather returned to the village and “reported” the incident. There was no point searching. The mother and his relatives mourned.

However, the boy was safe; his fall broken by an outcrop of cedars. There he was on his precarious perch with no possible way of getting out or off the nearly perpendicular wall. Even human help would be impossible. Here he waited, hoped, cried and prayed. On the fourth day his prayers were answered. He heard clicking of hooves and heard a voice saying, “My child, I have heard your cries and I have pity for you. I have come to rescue you. You must do as I tell you and do not be afraid.” A huge Bighorn Sheep came and eased up below him and instructed the boy to get on its back and hold on to its horns. He was told to close his eyes and not to open them until told to do so. And when he opened his eyes, he was on top of the canyon on level ground. There were seven bighorn sheep around him, and one of them spoke and said, “I am the chief of sheep. I am called Big Metal.” Big Metal was a magnificent creature with horns and hooves of glistening metal and the hooves rang like metal when he walked around. He gave the boy his name and powers. In turn the seven sheep gave the boy a power that each possessed; wisdom, sharp eyes, keen hearing, great strength, strong heart and sure-footedness. They then gave him a warning: “We seven rule these Bighorn Mountains. That river down there in the bottom is the Bighorn River. Whatever you do, don’t change its name. It shall be known as the Bighorn River. If you ever change the name of the river, there will be no more Absaroka (Crow). The Absaroka will be no more.”

Other animals then gave the boy “the right to practice their powers by calling upon them.” Among these gifts was knowledge, which was given by the badger. This clever creature taught

the young boy how to construct a sweat lodge and told him to build it when he returned to his village.

Upon seeing the boy return to the village, the stepfather fled as the young boy’s mother wept. Big Metal told his people about the bighorn sheep and gave them the warning which the sheep had given to him. Following the badger’s instructions, Big Metal built the sweat lodge and taught his people how to do the same.

When Big Metal grew into manhood, his people observed that he had “unusual powers – keen eyes, a fine sense of humor, a sharp mind. He was physically very active and strong. . . He became a good warrior.” Big Metal outlived four generations and before he died he told his people, “he desired to be buried next to the Bighorn River, because his fathers, the bighorn sheep, would come for him.”

One day Big Metal wrapped his blanket about himself and died. In accordance with his wishes, Big Metal was buried on the east side of his beloved Bighorn River about two miles above the mouth of Rotten Grass Creek.

Today thousands of visitors come to Bighorn Canyon drawn by the waters of the lake and the river. But it is the country itself and the deeply-rooted history of the people, who call this land home, which casts a spell over those who would let it. For this is the Bighorn and as the Bighorn, it shall endure.

Bad Pass Today, Scavenger Hunt



Student Handout

What makes the Bighorn Canyon Area so Special?

What has changed since the Native Americans and the Mountain Men traveled along the Bad Pass Trail?

Contemplate these questions while traveling through Bighorn Canyon.

Below are a few sites you may see:

1. Bighorn Lake: Bighorn Lake was once a river flowing across a level plain, but over thousands of years the river cut into the earth while the mountains were pushed upwards. The green color of the lake is from the algae in the water.

2. Bighorn Sheep: Nearly lost to this area, the bighorn sheep returned in the early 1970's.

3. Rock Cairns: Rock cairns are rock piles that mark the Bad Pass Trail.

4. Wild Horses: The Pryor Mountain Wild Horse Range was the first in the U.S.

5. State Boundary Signs: Watch for the Wyoming and Montana boundary signs that tell you that you're leaving one state and entering another.

6. Devil Canyon Overlook: From this spot, 1000 feet above Bighorn Lake, you can see the trail tracings of wild animals and look for birds of prey.

7. Tipi Rings: In the canyon area you may be able to find rings of stones that indicate where a tipi once stood. The stones held down the lower edge of the tipi and kept the wind from blowing into the tipi.

8. Cottonwood Trees: Alongside the creeks in the area are the "old growth" cottonwood trees that mark the path of the streams. Because of their deep tap roots, these trees can survive in harsh desert environments.



Pryor Mountain Wild Horses at
Crooked Creek *NPS Photo*

Activity 3 Life Science

Bighorn Sheep and Wild Horses Pete Sawtell

Two of the large animals that you are likely to see in Bighorn Canyon are bighorn sheep and wild horses. These two very different creatures share the land and resources in Bighorn Canyon and in the Pryor Mountains to the west.

Bighorn sheep (*Ovis canadensis*) are one of four native sheep species in North America. It is thought that the ancestors of the bighorn crossed the Bering Land Bridge during the last ice age about 12,000 to 15,000 years ago. These ancient sheep then spread out from Alaska to Mexico and adapted to various environments. The sheep in our area evolved into Rocky Mountain Bighorn Sheep.

Bighorn sheep are sexually dimorphic. This means that there are differences between males and females. For instance, a male or ram can weigh up to 300 lbs, while a female or ewe may only weigh 150 lbs. The rams, have big curled

horns, while the ewes have much shorter horns that curve slightly.

After a six month pregnancy, ewes give birth in the spring to a single lamb. Lambs are born on steep slopes and cliffs called lambing areas, chosen to protect the lambs from predators. Lambs can walk within a few hours and are able to eat solid food within a week. A ewe and her lamb will congregate with other ewes and their young in groups of five to fifteen animals for added protection. These groups stay near the canyon year round.

At the age of 3, young rams leave this group and form bachelor groups of one to four similarly aged rams. The rams summer in the cool Pryor Mountains where vegetation is easy to find. During the rut in the fall, rams return to the canyon to battle and mate.

Continued on page 25

Rams battle to prove dominance and to secure a chance to mate. They charge at each other, rearing up onto their hind legs and lowering their heads just before colliding at speeds up to 20 miles per hour. Bighorn rams have a double cranium, a unique adaptation that allows them to withstand the head trauma caused from these battles without serious injury. Their cranium is made up of two layers of skull with a soft, spongy material in-between that acts as a shock absorber for the brain.

The Pryor Mountain Wild Horses *Equus caballus* have a very different past than the bighorn sheep. The ancestors of modern horses were found in North America at the end of the Pleistocene era, the last ice age. They died out and horses continued to live only in the Old World. Then in the 1500's and 1600's, the Spanish brought horses over to the Americas. Some of these horses escaped and formed large herds that roamed the plains of North America. One such herd is the Pryor Mountain herd, which by some accounts has been in the area for about 200 years.

The social structure of the Pryor Mountain wild horses is that of a harem band. A stallion, or mature male, will have a group of one to three mares and their offspring, of which he is the leader. When a harem becomes too large for a stallion to control, other stallions will try to steal his mares. In fact, for every 10 mares, 4 will change harems annually.

Like the sheep, stallions will often battle for the right to mate. Instead of butting heads, horses will rear up on their hind legs and attack each other with their hooves. These mature, 1200 pound stallions will also chase, kick, and bite at their opponents.

The horses have winter and summer ranges similar to the bighorn sheep. In the summer the majority of the horses are found in the higher ranges of Pryor's due to the high availability of food and water. During the late spring and early summer many of the mares will foal after an 11 month pregnancy. In the winter, most of the horses can be found in the lower elevations where there is less snow and more forage.



Collared ewe in lambing area near Devil Canyon Overlook. NPS Photo



Collared ewe near Hillsboro. NPS Photo

Biologist in the Field By Christy Fleming

Bighorn Canyon has biologists on staff and visiting biologists that study the different animals found in Bighorn Canyon. This is a rewarding job, but also a hard one. To learn about an animal they must observe it. Some elusive animals are captured and fitted with radio collars. Biologists use radio telemetry to track and observe these animals. Some animals are easily found. When biologists find the animal, they sit in one place, sometimes for hours, taking notes on the movement of the animal, social interactions with other animals, or when they defecate. Often biologist will collect fecal samples from animals and can learn if the animal is healthy and what it has been eating. Biologists have recently studied the interspatial relationship between bighorn sheep and wild horses to see if both can survive while sharing their land and resources.

Biologists studying the sheep found that bighorn sheep prefer to live in semi-open areas with rocky terrain that allows many escape routes should a predator attack. They also found that the sheep like to eat grasses and shrubs; noting that most of their year round diet consist of Mountain Mahogany, winterfat, and some juniper. In the observed population, they found that bighorn sheep can live up to 20 years, but the average life expectancy was 10 to 14 years.

In the spring and early summer when the grasses are green, biologist found that a major part of both the horse and sheep diet is grass. Horses eat grass year round but also eat some shrubs like winter fat. Biologists found that although domestic horses have an average life expectancy of about 25 years, due to environmental factors, old age for a Pryor Mountain wild horse is about 16.

Ultimately biologists found that horses and bighorn sheep seem to have different enough diets that they aren't in serious competition with each other. There appears to be enough food and space available to accommodate both species adequately if managed properly.

Bighorn Canyon Habitats, A Biologist for the Day



Science, Language Arts, Art, Speaking and Listening

Standards:	Wyoming Science: Standard 1, Benchmark 1 & 3 Wyoming Language Arts: Standard I, Benchmark B Montana Art: Standard 1, Benchmark 3 Montana Speaking and Listening: Standard 2, Benchmark 1 & 2 Standard 4, Benchmark 3
Duration:	On Site 4 hours, visit a section of the park, do activity Off Site Visit – Watch a video of either horses or sheep and write down behavioral observations.
Class Size:	Any

Objectives

In their study of Bighorn Canyon biology, students will:

1. Identify the habits of horses and sheep.
2. Identify plants that horses and sheep feed on.
3. Describe the habitats of sheep and horses over the course of a year.

Materials

On Site

- Plant identification book to help identify Mountain Mahogany, Winterfat, and Juniper. Photos can also be found on the teacher supplemental disc.
- Notebook and pencil to take notes and do writing assignment
- Sturdy shoes
- Water
- Binoculars

Off Site

- Look at photos on the teacher supplemental disc or search the internet to find photos of Mountain Mahogany, Winterfat, and Juniper .
- Video
- Notebook and pencil to take notes and do writing assignment

Vocabulary

Sexually Dimorphic: is the differences related to the male and female of a species.

Pleistocene: The last ice age, ending about 11,500 years ago.

Ram: is a mature male sheep.

Ewe: is a mature female sheep. (Pronounced “you”)

Lamb: is a baby sheep.

Stallion: is a mature male horse.

Mare: is a mature female horse.

Foal: is a baby horse.

Filly: is a baby female horse.

Colt: is a baby male horse.

Bighorn Canyon Habitats, A Biologist for the Day Cont.



Science, Language Arts, Art, Speaking and Listening

Procedure

On Site

1. Stop at different areas in the park where horses and sheep may be seen.
2. Observe the horses, sheep, or both in their habitat.
3. Take notes as to their actions and interactions; note any “unusual” behaviors.
4. Draw or photograph distinctive markings.
5. Are any of the bighorn sheep collared?

Off Site

1. Discuss the unique features of the horses and the sheep.
2. Watch a movie on horses or sheep.
3. Take notes from the movie as to the animals’ interactions; note any “unusual” behaviors.
4. Draw distinctive markings

Additional Activities

Have a group discussion in class about what you saw. Share your photos, artwork, and field notes with the class.

Who am I?



Science, Language Arts, Art, Speaking and Listening

Standards: Wyoming Science: Standard 1, Benchmark 1 & 3
Wyoming Language Arts: Standard 3, Benchmark 1 through 5
Montana Art: Standard , Benchmark 3
Montana Speaking and Listening: Standard 2, Benchmark 1 & 2
Standard 4, Benchmark 3

Duration: 30 minutes

Class Size: Any

Objectives

In their study of Bighorn Canyon biology, students will be able to identify the animals of Bighorn Canyon by their characteristics.

Materials

- Reference materials
- Examples of animal profiles
- Blank 5" X 8" cards

Setting the Stage

There are several different animals that call Bighorn Canyon home. Some animals stay year round while other migrate through.

Procedure

1. Discuss the diversity Bighorn Canyon's wildlife with the students. This discussion should include the relationships of climate, topography, and vegetation.
2. Each student should select an animal that lives in Bighorn Canyon.
3. Have each student prepare an Animal Profile Card. Instruct students to offer characteristics of the animal in first-person. Read one of the profile card examples.
4. Ask students to draw a picture of the animal on the back of the card or write the name. (For younger students, they could draw what the animal eats, where it sleeps, where it lives, etc. . .)
5. Collect all of the Animal Profile Cards.
6. Break the class into two teams, each with a spokes person.
7. Read the cards aloud to the class. Read a few lines at a time. Stop to let each team guess.
8. While the cards are being read, each team should record the information. When asked each team works together to decide the animal. Flip a coin to see who goes first. Have the students guess the animal described. If they don't get it right, it goes to the next group. If the second group doesn't get it, read more from the card. This will go back and forth until one team gets it correct. That team will receive a point. The team with the most points in the end wins.

Examples of Animal Profile Cards



Student Handout

1. I like dry, warm country in the summer.
2. I have 32 teeth.
3. I don't live in forests.
4. I have a white rump patch.
5. I weigh about 130 pounds.
6. I eat grasses and sagebrush.
7. My young are called fawns.
8. Both males and females have horns.
9. I can run over 45 miles per hour for long distances.
10. I am misnamed for long-horned grazing animals of Africa and Asia.

I am a pronghorn.

1. I like to live in semi-open rocky terrain.
2. I can climb sheer cliffs.
3. I can weigh up to 300 pounds.
4. I use my big curly horns to battle for the right to mate.
5. Both males and females have horns.
6. I eat grasses and shrubs. Mountain Mahogany, winterfat and juniper are some of my favorites.
7. I go to live with other individuals my same age at age three.
8. I have a double cranium.
9. I can live up to 20 years.
10. My ancestors crossed the Bering Land Bridge during the last ice age.

I am a bighorn sheep, ram.

1. In the summer, I like to stay on the Pryor Mountains and in the winter, come down to the lower elevations.
2. I eat mainly grasses, but sometimes I like to eat shrubs.
3. I can weigh up to 1200 pounds.
4. I believe strongly in staying in a group.
5. I will bite and kick other that try to break up my family.
6. I can live to be 16 years old.
7. The BLM manages my population.
8. My ancestors went extinct during the last ice age.
9. The Spanish brought my kind to the Americas in the 1500 and 1600s.
10. I have zebra stripes on my legs and a dorsal stripe down my back.

I am a Pryor Mountain wild horse.



Yellowtail Dam NPS Photo

Level II

Fifth Grade to Eighth Grade

The activities in this section are designed for students in fifth through eighth grade. All activities can be changed to best suit the teachers need. The activities and levels are designed as building blocks. All of the items in Level I correspond in some way and are introductory to the items in Level II.

Activity 1

Geology

The Water's Work is Never Done

By Paul Gordon

About sixty-million years ago, a river meandered north to the Arctic Ocean across a continent vastly different from the North America of today. The land was already old, so old it is hard to grasp its antiquity. Even then, where the north bound river ran, change after change had taken place. Great oceans had come and gone; mountain ranges had appeared and eroded away. Beneath the place where the river flowed, bygone

seas had deposited layer upon layer of sedimentary rock, including the massive formation today called the Madison Limestone through which modern Bighorn River has cut its way. There had also been climatic changes: long periods of warm or cool weather, times when rains poured upon the land, times when desert-like conditions prevailed. Life had changed as well as the land and

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The river clawed at its bed, at times keeping pace with the rising of the land, at times blocked in its rush to the sea forming natural lakes.

the climate. The early seas that covered this land had been home to myriads of creatures whose fossils are entombed today in Bighorn Canyon's limestone. Land creatures had also walked this country; the long age of the dinosaur had already come and gone. These great creatures had roamed this land and disappeared, leaving only enough evidence of their existence to tantalize and intrigue us. Mammals had inherited the plains and the banks of the river. Camel, horse, mammoth, musk-ox, and lion were among their number. Like the dinosaur, they in turn would vanish. Plants had also changed. Simple one-celled species, flowering shrubs, grasses, and finally massive trees had appeared, lived their span, and disappeared.

But still change was ongoing, as deep beneath this scene, the earth stirred and rumbled. The land rose, at times rapidly and at other times only infinitesimal fractions of an inch in decades. The river clawed at its bed, at times keeping pace with the rising of the land, at times blocked in its rush to the sea forming natural lakes. In time natural dams were eroded, allowing the river to travel on, in its never ending alteration of the land.

This process has continued throughout the ages. In time the Bighorn and Pryor mountains came to dominate the landscape, at times rising slowly, and at other times pushing upward through seismic activity.

Side canyons draining the Bighorn and Pryor Mountains; have cut down to the level of the mother stream. In so doing, these canyons have carved and created mini-climates and little hidden worlds of their own. These places are often oases in the drier, harsher climate on the

southern end of the recreation area and warmer spots in the wetter, cooler northern portion. As the water whittled away at the landscape, carving Bighorn Canyon and its tributaries, the Bighorn was loaded with vast amounts of sediment. This served as an abrasive, wearing away the rock beds of the river and drainages, gouging loose more material to be carried downstream, some as far as the Gulf of Mexico.

The construction of Yellowtail Dam in the 1960s had the most dramatic influence of any event ever on the canyon-cutting actions of the Bighorn River. The dam changed the rapidly flowing, silt-laden stream into a gentle moving lake. When the river lost its velocity, it also lost its ability to maintain its load of eroded material. Mud and silt quickly settled to the lake bottom, creating deposits over thirty feet thick in the southern portions of the lake.

Prior to the construction of Yellowtail Dam, the Bighorn was not only muddy and silt-laden, but its water volume also fluctuated. The dam regulates downstream flows and the river runs clear, its load of sediments left behind in Bighorn Lake.

Although Yellowtail Dam has greatly altered the recent canyon-cutting activities of the Bighorn, it has not stopped them. The upper reaches of the tributary canyons are still being whittled away, be it ever so slowly.

Yellowtail Dam, like all man-made objects, is temporary, when measured in geological time. Canyon cutting and mountain building are measured in millions of years. The life of a dam is measured in hundreds. So even now, the water's work continues.

Geology Rocks at Horseshoe Bend

The rocks in the ridge overlooking Horseshoe Bend are a record of dramatic changes in the climate and environment of this region over time. All of the rock layers visible at Horseshoe Bend were deposited during the Mesozoic Era (66-245 million years ago). During this time, amphibians, reptiles (including dinosaurs) and primitive plant forms dominated the land. Mammals and flowering plants began to appear near the end of this Era.

The red rocks at the base of the ridge (Chugwater Formation) records a time when the area probably had an arid, coastal plain environment. The overlying gray beds (Gypsum Springs Formation) probably indicate a similar environment persisted with the addition of shallow, warm seas.

The Sundance Formation contains abundant

marine fossils and records a time when an ocean flooded the area. The most common fossils are Crinoid stem fragments (Pentacrinus), belemnites (Pachyteuthis), and oysters (Gryphaea). These fossils are the remains of marine organisms that settled to the sea floor, were buried, and preserved in the sea-floor mud. The Morrison Formation records a retreat of the ocean and return to a coastal plain environment, now more tropical with lush plant growth. Dinosaurs roam the region. Dinosaur fossils have been found in the Bighorn Canyon Area and surrounding basin.

The Pryor Conglomerate forms the top to the ridge and is the base of the Cloverly Formation. This coarse-grained rock resulted from the sand and gravel left behind by eastward-flowing streams that drained rising mountains in the area of present day western Montana.

Bighorn Canyon Fossils, Paleontologist for a Day



Science, Language Arts, Speaking and Listening

Standards:	Wyoming Science: Standard 1, Benchmark 9 Standard 2, Benchmark 2 & 3 Wyoming Language Arts: Standard 3, Benchmark 1, 2, 5, & 6 Montana Speaking and Listening: Standard 2, Benchmark 1 & 2
Duration:	On Site 45 min., tour Horseshoe Bend Off Site 1 hour lesson using the Horseshoe Bend geology layers word document and fossil photos found in the geology section of the teacher supplement disc.
Class Size:	Any

Objectives

In their study of Bighorn Canyon geology, students will:

1. Identify the geologic layers at Horseshoe Bend.
2. Identify fossils and the layers they can be found in.
3. Describe the landscape around Horseshoe Bend and how it has changed through time.

Materials

On Site

1. Fossil worksheet
2. Magnifying glass
3. Notebook and pencil to make notes
4. Bighorn Canyon Stratigraphy card (Found under handouts in the geology section of the teacher supplement disc.)
5. Sturdy shoes
6. Water

Off Site

1. Create a virtual tour or Power Point presentation of Horseshoe Bend by using photos and handouts found on the teacher supplement disc.
2. Notebook and pencil to take notes

Vocabulary

Paleontologist: is a person that studies fossils.

Belemnite: is a fossil of a squid-like creature with a long bullet-shaped shell.

Crinoids: are star shaped fossil of marine sea lilies which attached themselves to the sea floor.

Mesozoic Era: records a time 230 to 65 million years ago also referred to as the Age of Reptiles.

Paleozoic Era: records a time 570 to 230 million years ago also referred to as the Age of the Fishes.

Cenozoic Era: records a time 65 millions years ago to present day, also referred to as the Age of Mammals.

Bighorn Canyon Fossils, Paleontologist for a Day Cont.



Science, Language Arts, Speaking and Listening

Setting the Stage

Discuss how nature has a way of changing over time. What are some of the reasons nature changes? (hurricanes, tornadoes, flash floods, fire, and climate changes.) Discuss how the area of Horseshoe Bend has changed over time, including the recent droughts and how there is evidence of all these changes recorded in the rocks and dirt surrounding them.

Procedure

On Site

1. Explore the Horseshoe Bend area with the Park Ranger.
2. Listen to the Ranger Talk about the fossils and layers.
3. Draw pictures of the fossils found, take notes of where they were found, what they are and what geologic layer they came from.
4. Return to the classroom and share your notes with the class.

Off Site:

1. Show the slide/power point presentation of Horseshoe Bend to the students. Discuss the different layers and pass around fossils from that area.
2. Fossils could be hidden in buckets of sand. Students could use their imagination to put themselves at Horseshoe Bend. They could then record their findings and report back to the class.

Additional Activities

Students could assist in creating a fossil bulletin board using their drawings and journal pages. Teachers could plan a trip to the library to learn more about fossils and paleontologists.

Bighorn Canyon Fossils



Student Handout

The following fossils are found in the Bighorn Canyon Area.
Match the fossils with their correct names.

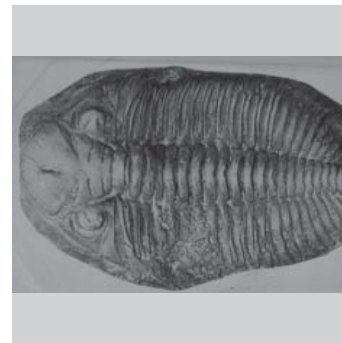
1. Trilobite (Cambrian Era)



2. Crinoids (Jurassic Era)



3. Belemnite (Jurassic Era)



4. Graptolite (Jurassic Era)



Finding the Treasures of Bighorn Canyon



Student Handout

Many people hiking Bighorn Canyon National Recreation Area will use the trails and hiking guide, but some go off trail. The off trail users use maps and compasses to return to their starting point or an interesting geologic formation . Practice your orientering skills with the three activites below.

Destination Bighorn Canyon - On Site

1. Your teacher has choosen a trail for you to hike.
2. Your are on one of two teams. Each team will go to different destinations.
3. Each team will chose their destination.
4. The team needs to take notes on how they got to their destinations using a map and a compass.
5. The teams will return to the starting point and exchange notes.
6. The opposite team must use a map and compass to find the other teams destination.
7. Teams return to the starting point.
8. Did your team find the others destination? If not, what should have been done differently.
9. Did the other team find your destination? If not, what should have been done differently.

Rock Hunt - Off Site

1. Find a rock and drop it at your feet.
2. Follow the directions below correctly and you should end up at the same place you started.
 - a. Walk 10 steps at 300 degrees
 - b. Walk 10 steps at 60 degrees
 - c. Walk 10 steps at 180 degrees
3. Did you end up back at your rock? If not, try again.

Orienteering Competition

Break into teams. The teacher has chosen 10 destinations. Follow the steps from your starting point to test your directional skills. When you find your destination write it in the blank before the number. Good Luck. Remember, you need to begin each directions at the starting point.

1. Walk 100 feet at 60 degrees.
2. Walk 100 feet at 310 degrees.
3. Walk 30 feet at 180 degrees.
4. Walk 180 feet at 340 degrees.
5. Walk 30 feet at 280 degrees.
6. Walk 180 feet at 40 degrees.
7. Walk 140 feet at 20 degrees.
8. Walk 90 feet at 0 degrees.
9. Walk 50 feet at 220 degrees.
10. Walk 150 feet at 240 degrees.

When you are finished, check you answers with the teacher.
The first team with the correct answers wins.



Root Cellar at Hillsboro NPS Photo

Activity 2 History

Bighorn Canyon Characters Christy Fleming

After the mountain men stopped using the Bad Pass Trail, Settlers began to arrive. All of them came for different reasons.

Henry Clay Lovell was drawn to the area in 1883 by the open range which was well suited for cattle grazing. Anthony L. Mason, a Kansas City, Missouri capitalist, was Lovell's financial backer. Their ranch soon became known as the ML Ranch. During the heyday of the open range, the ML Ranch ran cattle as far south as Thermopolis, Wyoming and as far north as the Crow Reservation in Montana. The harsh winter of 1886-87 cut their herd in half. After Mason's death in 1892, Lovell continued to ranch until his death in 1903.

In 1896, Erastus T. Ewing brought his family and his partners to Bighorn Canyon in search of gold. While some gold was found, it was not in paying quantities. Ewing's partners left, but the Ewing family stayed. They settled

at what is now the Ewing/Snell Ranch and began ranching. After changing hands a couple times Philip and Alma Snell purchased the ranch in 1920. The ranch is named after Erastus Ewing, the man that established it and the Snells, the family that lived there the longest.

Grosvener W. Barry, like Erastus, was drawn to the canyon by gold in 1903. After starting three different gold mining companies, he found that he was not going to extract a fortune in gold from the Bighorn Canyon placer deposits. Being a promoter at heart, Barry and his family turned to dude ranching. He advertised his Cedarvale Ranch as a sportsman's paradise. Guest could stay all summer if they wanted. In 1915, a post office was established and put the Cedarvale Ranch on the map as Hillsboro, Montana. Grosvener W. Barry is credited as being the first person to

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recognize and exploit the recreational opportunities of Bighorn Canyon.

Caroline Lockhart came later. In 1926 she purchased 160 acres on the Dryhead and began to pursue her goal of becoming the Cattle Queen of Montana. By this time in her life she had already been a newspaper correspondent for the Boston Post, the Philadelphia Bulletin, and the Denver Post. She had also published six novels and was hoping the quiet pace of ranch life would allow her time to write more. She found that ranching was hard work and didn't leave much time for writing. She was able to complete one last novel while on the ranch.



Employee carves notch replicating the craftsmanship of the original builder.
NPS Photo

Taking Care of the Past By Christy Fleming

Bighorn Canyon has four historic ranches. They are each different, but have several similarities. Each represents life on a western ranch beginning with the Mason/Lovell Ranch in 1883 up to 1965. Each is remote, dependant on their own resources for survival.

Now abandoned by their previous tenants, these ranches are an important part of the Bighorn Canyon story. Today the ranches are used to tell people about a way of life.

Over the years the logs in the buildings shrink or rot, sod roofs start to decay, and buildings start to lean. To be able to continue to enjoy the ranches as part of the park history, we need to maintain them. Over the last several years the Cultural Team of the Resource Management Division have been restoring the buildings a little at a time. Their work is very important, but time consuming. Before they lift one finger to begin the hard work ahead, they must research, record, and document the buildings. All of their work must be approved by the State Historic Preservation Office (SHPO). Their goal is to preserve the buildings integrity and replicate the original craftsmanship. Often times the original carpenters, being a long way from town, had to make due with what they had and sometimes they couldn't use the best building practices.

After the documentation is finished, the cultural team begins to work on the building. First the building is stabilized so that it won't cave in or become a safety hazard. Next they take the dirt off the sod roof. They record the placement of

When three loads of Lockhart steers topped the market in Omaha in 1953, Caroline must have indeed felt she was the "Cattle Queen". She controlled over 7,000 acres when she sold the ranch in 1955.

These are just a few of the characters that make up the Bighorn Canyon story. There were cattle rustlers, miners, farmers, and people just passing through. You can learn a lot about the history of an area by looking at the life stories of the people that lived there.

the logs and remove rotten timbers. Using turn buckles they then straighten the building if it is needed. Next they look at sill logs, the logs at the bottom of the building. Generally these are the first to rot as they rest close to the ground. To replace them the entire cabin must be jacked up. The lowest logs that need replacing are done first working up from the bottom log. Again the goal is to replicate the craftsmanship of the original builder. New logs are peeled and worked with hand tools to look as close to the original log as possible. It is then put into place. After the logs are replaced, the building is put back into place and the roof is addressed. New roof logs are set with a moisture barrier over top. Then the dirt that was taken off is put back on. An erosion fabric laid over the dirt to keep it in place until the seeds planted on the roof sprout. Establishing a root system is the key to maintaining the sod roof. Lastly doors frames are straightened, windows are replaced, and chinking is applied.

Some buildings need to be totally worked over, while some just need a pane of glass here or a new log there. The point of all of this is to maintain the buildings so that their stories will continue to be told.



Montana Conservation Corps dump buckets of dirt for a new sod roof on the shop at Lockhart.
NPS Photo

Ranches of the Past



Social Studies, Speaking and Listening

Standards: Wyoming Social Studies: Standard 4, Benchmark 1 & 3
Montana Speaking and Listening: Standard 2, Benchmark 1, 2, & 3

Duration: On Site
1 day, tour all four historic ranches

Off Site
1 to 2 hour lesson, Read articles or rely on notes taken during the field trip to compare the similarities of the ranches.

Class Size: Any

Objectives

After learning about the historic ranches located at Bighorn Canyon, students will:

1. Identify similarities between the four historic ranches.
2. Have an idea of how life was like on the ranch.
3. Be able to discuss the purpose of the buildings on the ranches and compare that to their own homes.

Vocabulary

Irrigation: used to supply dry land with water by means of ditches, pipes, or streams.

Sill Logs: are the horizontal logs that rest on the foundation and forms the base of a wall.

Chinking: is the material used to fill a long, narrow crack or gap between logs, often consisting of clay mixed with other materials including sand, lime, stones, and hair.

Daub: is the rough mortar, clay, or plaster smeared on a surface; used for chinking.

Setting the Stage

Bighorn Canyon has four historic ranches. They were all established at different times and with different purposes in mind, but they have many similarities. These similarities can help us to understand what it was like to live during that time. What are some of the similarities and what does that tell us about life in the Bighorn Canyon area from 1883 to 1965?

Procedure

On Site

1. Explore each of the historic ranches.
2. Record information about each of the buildings.
3. Observe the way the buildings have been built and are being restored.

Off Site

1. Read about each of the four ranches.
2. Take notes on the differences and similarities.
3. Discuss, using notes taken at the ranch, what life must have been like.

Additional Activities

Volunteer to help with restoration projects at an area near you, (chinking and daubing, peeling logs, replacing sod roofs, etc. . .).

Letters to the Past



Language Arts, Reading, Speaking and Listening, Writing

Standards:	Wyoming Language Arts: Standard 1, Benchmark III – A,B,C,D,E, Standard 2, Benchmark I - A,C,D,E,F,G, Standard 2, Benchmark II - A,B, Standard 3, Benchmark 1 & 2 Montana Reading: Standard 4, Benchmark 7 Montana Speaking and Listening: Standard 2, Benchmark 1, 2, & 3 Standard 3, Benchmark 1,2, & 3 Montana Writing: Standard 1, Benchmark 1, 2, 3, & 4 Standard 4, Benchmark 1 & 2
Duration:	Time for research and presentations
Class Size:	Any

Objectives

Students will learn research techniques and the proper letter writing format.

Setting the Stage

Local students will write a letter to one of the historic characters of Bighorn Canyon. Students from farther away will choose characters that were important to their areas history.

Procedure

1. Students will be able to choose from a list of Bighorn Canyon Historic Characters
 - a. Caroline Lockhart
 - b. Anthony Mason
 - c. Henry Clay Lovell
 - d. Robert Yellowtail
 - e. Erastus Ewing
 - f. Doc Barry
 - g. Link Hannon
 - h. Eddy Hulbert
 - i. Frank Sykes
2. Students will be given a week to research their character using at least two sources. One may be the short essays under History on the teacher supplement disc.
3. Students will then be asked to write a letter to their character
4. Students will present to the class a short history of their character and why they were an important part of the history of Bighorn Canyon
5. Students will then read their letter to the class.

Additional Activity

For local students, Students will be guided through the historic ranches. If the character they researched was part of the ranch history, the student may choose to help during the Ranger Lead Program during the field trip.

For students that are unable to come to Bighorn Canyon, they may be able to visit the home of their character either in person or on the internet.



Cactus near Devil Canyon Overlook
NPS Photo

Activity 3 Life Science

Adapting to Habitats Pete Sawtell

Bighorn Canyon is an especially diverse area. Within 70 miles, one can experience several extremely different habitats. A journey from the southern end of the canyon to the north showcases every habitat from the arid desert to the lush forests.

Beginning the journey in the south, one encounters an old-growth cottonwood riparian zone along the riverbanks. The water and cover of the cottonwoods creates a good habitat for deer, bald eagles, muskrats, ducks, geese, birds and lots of other animals.

Slightly farther north, an arid, desert type environment is home to the prickly pear cactus, sagebrush, and juniper bushes. Lizards, snakes, cottontail rabbits, bighorn sheep, and coyotes call this habitat home.

After leaving the desert, one enters a cooler

environment with Douglas fir and Ponderosa pine. Black bears, elk, and an occasional moose call this home.

The north end of the canyon opens up into a grassy plain. Pronghorn can be observed grazing among the rolling hills with hawks soaring overhead.

Often overlooked is the main habitat that stretches the entire length of the canyon, Bighorn Lake. The underwater habitat provides a home for many types of fish including walleye, bass, and catfish. Many plants and animals depend on the Bighorn Lake as part of their habitats as well.

Animals have to adapt in order to live in different habitats. Some animals are very

Continued on Page 41



Yucca at Horseshoe Bend S. Morstad



Juniper D. Cory

adaptable. The coyote, for example, can live in many types of environments. Others, like rainbow trout, can only live in a specific type of environment. They need cold, clear streams, with rocky bottoms for survival.

Animals aren't the only ones who have had to adapt to live in the Bighorn Canyon; people have lived here too, for over 10,000 years. Native Americans had to adapt to these environments, gleaning all of their food and medicine from the land. Native Americans would hunt wild game such as bison, deer, and antelope to provide themselves with meat. They would also gather and eat plants such as the fruit of the prickly pear cactus, yucca flowers, and seeds from limber pine. They would make medicine out of Juniper, Douglas fir, and many other plants. In fact Native Americans, traveling through this area had a use for just about every type of plant they encountered.

It doesn't matter if you are a Bighorn sheep, wild horse, plant or even a person; every creature in the Bighorn Canyon needs water to survive. People and animals are able to move around to find good sources of water, but plants cannot. A plant has to adapt to its surroundings.

The prickly pear cactus, a plant easily found in Bighorn Canyon, is very well adapted to a limited supply of water. One adaptation that the cactus has developed to help it go long amounts of time with a limited water supply is that they don't have leaves. If a plant has leaves, it will lose more water to the air. With smaller or no leaves a plant can maintain a higher level of moisture. Prickly pears

are very good at storing water in their stems and can go a long time without water. They also have broad, shallow root systems, so when it does rain, even for a short amount of time, they can suck up a lot of the available water. Cacti have waxy skin to seal in moisture. These are some of ways that cactus have adapted to life in a hot, dry climate.

Whether a plant, animal, or person, everything needs to have a place to live, a habitat. There are many types of habitats in Bighorn Canyon, and there are some plants and animals that are well adapted for one or more of those different homes.

Adaptations to Living



Science

Standards: Wyoming Science: Standard 1, Benchmark 5 & 6

Duration: On Site
A day long field trip

Off Site
Two hours
Class Size: Any

Objectives

Students will understand how plants and animal adapt to living in their habitats.

Vocabulary

Habitat: is a home for plants and animals.

Riparian Area: is a stream or riverside habitat.

Desert: is an arid land with few plants.

Forest: a wooded area with many trees.

Evergreen: is a tree or plant that keeps its leaves or needles all year round.

Adapt: is to adjust or change (to an environment).

Procedure

On Site

1. Stop at different areas in the park and discuss the different types of habitat.
2. Ask questions:
 - a. What types of animals might live here?
 - b. What plants live here?
 - c. What special adaptations do they have?
3. If you see any cactus, show the adaptations. Ask if they can remember any of the ways the cactus can survive in harsh environments.
4. Supplement flash cards for plants or animals that may not be seen while in the different habitat areas. Flash cards can be made using photos from the teacher supplement disc.

Off Site

1. Talk with the class about a habitat being a home.
2. Ask the students about their habitat? Ask them what we need to survive? (Food, water, shelter, etc.)
3. Make flash cards using photos of animals to discuss different habitats and adaptations they use.

Invent An Animal



Science, Art, Language Arts

Standards: Wyoming Science: Standard 1, Benchmark 3, 5, & 6
Wyoming Language Arts: Standard 3, Benchmark 1, 2, & 6
Montana Art: Standard 1, Benchmark 3 & 4

Duration: 2 hours – for discussion, drawing, and presentations

Class Size: Any

Objectives

The students will:

1. Identify specific adaptations that aid animals in survival.
2. Understand the special environment of Bighorn Canyon and its diverse habitats

Vocabulary

Ecosystem: is a large ecological unit or area where plants and animals live and interact with the abiotic factors of the physical environment.

Abiotic factor: is a characteristic of the physical environment such as temperature, humidity, slope, soil type, shade, and wind.

Community: are the living components of an ecosystem. The plants and animals forming the community are dependent upon one another.

Niche: is the role a particular organism plays within its community, its job.

Species: are organisms with shared characteristics, capable of interbreeding.

Carnivore: is an animal that eats meat.

Omnivore: is an animal that eats both plants and animals.

Herbivore: is an animal that eats plants.

Materials

1. A field guide to birds, mammals, and reptiles
2. Drawing paper
3. Colored pencils

Invent An Animal Cont.



Science, Art, Language Arts

Procedure

All organisms that live in varied habitats have physical, biological, and behavioral adaptations that help them survive in their environment. In this activity students will work collaboratively to create fictitious animals in order to understand adaptations that help wildlife survive.

1. Explain how physical, biological, and behavioral adaptations help plants and animals survive.
2. Ask the students to list examples of physical, biological and behavioral adaptations among plants and animals that help them to survive.
3. Divide the class into small groups.
4. Explain that each group will be designing or creating a new animal for the Bighorn Canyon Area.
5. One student in each group should be designated as the sketch artist. Another should keep a list of the special adaptations this creature will have to survive in Bighorn Canyon.
6. Distribute field guides as reference material.
7. Have student choose a habitat from “Adapting to Habitats” and explain that the animal they invent must have adaptations that enable it to thrive in the habitat it has been assigned.
8. The following questions should be addressed:
 - Does your creature lay eggs? If so, how many eggs?
 - Does your creature give live birth? If so, when and how many are born each year.
 - Is your creature camouflaged? In what way does it blend into its habitat?
 - Is your creature a carnivore, omnivore, or herbivore? What does it eat?
 - Does it have enemies?
 - How does it protect itself?
 - Where does your animal live in its habitat? (example – a den, a nest, an open field)
9. Allow 15 – 20 minutes for the students to design their creature. Have them present their creature to the class and answer the above questions. Make sure that the students name their creature.
10. Have other students take notes and ask questions or make comments about the animals presented.
11. Hang the drawings in the classroom.

Resources

The following resources were used in developing the Bighorn Canyon Curriculum

Resources

1. About the Crow: History: Robert Yellowtail, Little Big Horn College Library, <http://lib.lbhc.cc.mt.us>, 2002
2. Arches National Park Education Programs, Teacher's Guide
3. Aztec Ruins National Monument, Teacher's Guide
4. Bighorn Canyon Junior Ranger Booklet
5. Evert, Laura, *Take-Along guide Rocks, Fossils, and Arrowheads*, Northword Press, Minnetonka, Minnesota, 2002.
6. *Expedition: Yellowstone!*, A Curriculum-Based residential program for grades 4-8 in Yellowstone National Park.
7. Klondike Gold Rush National Historic Park, Teacher's Guide
8. Paul Gordon, *Bighorn Canyon National Recreation Area*, Falcon Press, 1990.
9. "Montana Content and Performance Standards", <http://www.opi.state.mt.us/accred/cstandard.html>/ Last modified November 21, 2006.
10. Mountain Men on the Bad Pass Trail, Bighorn Canyon National Recreation Area site bulletin
11. *Wild, Wonderful Wyoming*, "Choices for the Future", *Elementary Activities*. The Statewide Integrated Conservation Education Program.
12. *Wild, Wonderful Wyoming*, "Choices for the Future", *Secondary Activities*. The Statewide Integrated Conservation Education Program.
13. "Wyoming Language Arts Content and Performance Standards", Wyoming State Board of Educations. Adopted July 7, 2003.
14. "Wyoming Science Content and Performance Standards", Wyoming State Board of Educations. Adopted July 7, 2003.
15. "Wyoming Social Studies and Performance Standards", Wyoming State Board of Educations. Adopted July 7, 2003.

Additional Resources for Purchase through Western National Parks Association

1. Gordon, Paul, Bighorn Canyon National Recreation Area. Falcon Press, Helena and Billings Montana, 1990. \$4.95
2. Gordon, Paul, Bighorn Canyon National Recreation Area. Southwest Parks and Monuments Association, Tucson, Arizona, 1999. \$3.95
3. Kathrens, Ginger, Cloud's Legacy, The Wild Stallion Returns. BowTie Press, Irvine, California, 2003. \$24.95
4. Kathrens, Ginger, Cloud, Wild Stallion of the Rockies. BowTie Press, Irvine, California, 2001. \$24.95
5. Kathrens, Ginger, Nature, Cloud, Wild Stallion of the Rockies. DVD, Thirteen, New York, 2003. \$24.95
6. Land of the Bighorn. DVD, Western National Parks Association, Tucson, Arizona, 2004. (Includes park maps, DVD-CD ROM Content, Six historic photo galleries) \$19.95
7. Land of the Bighorn. VHS, Western National Parks Association, Tucson, Arizona, 2004. \$12.95

**These and other titles are available for purchase. Teachers receive a 15% discount. To place an order, please call the Cal S. Taggart Bighorn Canyon Visitor Center at 307-548-5406. Shipping charges may be added.